

### REMARKS

The Office action dated October 2, 2008, and the references cited therein have been received and carefully reviewed.

The rejection of claims 1-7 and 15-19 under 35 U.S.C. § 102(b) as being anticipated by Kron et al. (US 2002/0018900) is respectfully traversed.

The present invention relates to a novel hardener for curing epoxy resins. The product may be stored before use for several months if necessary. Applicants' hardener comprises a sol prepared by controlled hydrolysis and condensation of compounds of the type  $(X-B)_nSi(-Y)_{4-n}$ .

Some characteristics of the hardener of the present invention are:

- the hardener is a reactive compound containing  $NH_2$  groups;
- the hardener is capable of reacting with another component (a resin) containing groups that are complementary to the  $NH_2$  groups, primarily epoxy groups;
- each of the components needs to be stable and have a shelf life of typically 6-12 months;
- an appropriate mixture of the hardener according to the present invention and an appropriate resin cures at ambient

temperature within minutes or a few hours;

- neither the hardener nor the resin may emit volatile organic compounds (VOC) during or after curing (at ambient temperature).

A method of preparing the hardener will involve the following steps:

- hydrolysis of aminosilane;
- removal of VOC by vacuum distillation, resulting in a sol called Product 1);
- optional mixing of Product 1 with an appropriate amount and type of commercial hardener, resulting in a Product 2);
- possible storing of Product 1 or Product 2 for a period up to 6 or 12 months.
- when Product 1 or Product 2 are finally mixed with an epoxy resin curing occurs within minutes or a few hours at ambient temperature.

A critical aspect of the present invention is that the hardener is in the form of an amino functional sol (page 5, lines, 16-18, of the specification), a nanoparticle-based mixture which is extremely stable. The sol is prepared by controlled hydrolysis and condensation (page 3, lines 12-13, of the specification). The advantageous properties which can be obtained by having the hardener in form of a sol are

possibly due to the number of amino groups available for crosslinking/unit area. This gives a high degree of crosslinking, resulting in the superior abrasion properties and scratch resistance of the resulting epoxy material, compared with epoxy materials prepared using known hardeners.

The Kron et al. reference does not disclose or suggest an epoxy hardener in the form of a sol.

Rather, Kron et al. describes a coating composition based on hydrolyzed crosslinkable silanes, metal compounds, non-crosslinkable silanes and an organic pre-polymer. In Kron et al., the coating composition is mixed during the manufacturing process, and no curing at room temperature is disclosed. The curing is carried out at 160°C, and solvent has to be evaporated during the curing process. No shelf-life of a separated hardener component is disclosed, and no amine number of a separated hardener component is disclosed.

Clearly, no separate hardener component is identified by Kron et al., in which the described coating composition is shown to have permanent adhesion even under unfavorable corrosive conditions (see paragraph [0009]). This is quite different from Applicants' two-component system, where the hardener requires at least one other component to be able to crosslink.

Accordingly, since Kron et al. fails to disclose or suggest an epoxy hardener in the form of a sol prepared by controlled hydrolysis and condensation as defined by the present invention, it is believed that the rejection of claims 1-7 and 15-19 under 35 U.S.C. 102(b) is unsustainable and should be favorably reconsidered and withdrawn.

The rejection of claims 1, 5, 7, and 15-19 under 35 U.S.C. § 102(b) as being anticipated by Hughes (US 5,786,032) is respectfully traversed.

The Hughes reference does not disclose or suggest an epoxy hardener in the form of a sol.

Hughes describes a coating composition comprising a mixture of a non-silane organic epoxy compound and a partially hydrolysed aminosilane reacted with a carbonyl-containing compound in an organic solvent. No sol is involved in any stage of the Hughes process, in which the hydrolysis of the aminosilane is only partial.

The Hughes process is described at column 2, lines 24-36, and may be summarized as follows:

- aminosilane is partially hydrolyzed with no removal of volatile organic compounds (VOC), thus producing a solution A, an amino silane hydrolysate;

- solution A is mixed with a bifunctional epoxy component, thus initiating a reaction;
- the reaction is quenched by adding excess of solvent compounds (VOC);
- no curing occurs;
- the result is a coating solution which is used to prepare a coating on polycarbonate surfaces by dip coating and thermocuring at 121°C (see examples 2 and 3).

Since Hughes clearly fails to disclose or suggest an epoxy hardener in the form of a sol prepared by controlled hydrolysis and condensation as defined by the present invention, it is believed that the rejection of claims 1, 5, 7, and 15-19 under 35 U.S.C. 102(b) is unsustainable and should be favorably reconsidered and withdrawn.

The rejection of claims 2-4 under 35 U.S.C. 103(a) as being unpatentable over Hughes in view of Kron et al., and the rejection of claim 20 under 35 U.S.C. 103(a) as being unpatentable over Hughes in view of Kron et al. are respectfully traversed.

As discussed above, neither Kron et al. nor Hughes taken individually disclose or suggest an epoxy hardener in the form of a sol prepared by controlled hydrolysis and condensation, as defined by the present invention. It follows that a

combination of the Kron et al. and Hughes references does not cure the deficiencies of the individual references.

Accordingly, the rejection of claims 2-4 and 20 under 35 U.S.C. 103(a) should be favorably reconsidered and withdrawn in the light of the present amendment and arguments.

Applicants respectfully traverse the provisional rejection of claims 1-7 and 15-17 on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the combined limitations of the claims of US 2007/0290176, and the provisional rejection of claims 1-7 and 15-17 on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the combined limitations of the claims of US 2007/0260030.

Each of the cited applications were filed (and published) after Applicants' October 16, 2002, invention date, and are therefore not prior art. Clearly, neither of the cited publications discloses a hardener for curing epoxy resins or a method for curing epoxy resins.

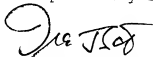
As such, the provisional rejections of claims 1-7 and 15-17 on the ground of nonstatutory obviousness-type double patenting based on US 2007/0290176 and US 2007/0260030 are unsustainable and should be withdrawn.

Applicants submit that the present application is now in

condition for allowance and early notice of such action is earnestly solicited. If any final points remain that can be clarified by telephone, Examiner Feely is respectfully encouraged to contact Applicants' attorney at the number indicated below.

**Applicants hereby petition the Commissioner for Patents to extend the time for reply to the notice dated October 2, 2008, for two (2) months from January 2, 2009, to March 2, 2009. A duly completed credit card authorization form is attached to effect payment of the extension fee.**

Respectfully submitted



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